Grant Final Report

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ParentLink: Better and Safer Emergency Care for Children

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Abstract

Purpose: The *ParentLink* project developed and tested a parent-driven health information technology (HIT), with the goal of linking knowledge parents of children possess to a base of evidence in support of safe and effective care in the emergency department (ED).

Scope: Optimal care begins with a complete patient history. ED-based HIT must support a data-intensive workflow and address problems of missing or inaccurate information.

Methods: A quasi-experimental intervention study at two ED sites evaluated the effect of a patient-centered HIT. Three month control periods alternated with 3 month intervention periods when a parent-driven HIT application, *ParentLink*, generated a shared action plan. Primary outcomes included: 1) data quality of the history, current medication list, and allergies to medicines, 2) medication errors, and 3) incorrect actions (correct actions not initiated or incorrect actions taken) across 4 common disease states.

Results: A novel parent-centered HIT was developed and tested. 2002 parents were screened, and 1410 of 2002 were enrolled. 1097 subjects had a total of 2234 orders or prescriptions written. Preliminary analysis demonstrated improvements in data quality achieved with *ParentLink* for symptom documentation and the allergy history. Minimal impact on medication errors and incorrect actions was found during the intervention.

Key Words: pediatrics; emergency medicine; parent; medical history taking; medication errors; documentation; medical informatics; information science; decision making; clinical decision support systems

Final Report

Purpose

The ParentLink project promotes a simple concept—the history as told by the parent has value—and demonstrates just how valuable patient-derived data can be for improvements in quality and safety. This project addresses two unsolved aspects of systems-based engineering that relate to quality and safety in health care: 1) how to populate a centralized knowledge base with accurate and patient-produced data at the front end of a health care visit; and 2) how to integrate these data with clinical guidelines to drive safe and effective decision-making. The name ParentLink speaks to the major purpose behind our child-focused technology effort—to link the knowledge parents of ill children possess to a base of evidence and guidelines that can produce just-in-time support. The ParentLink Project is a pediatric model of a patient-centered, collaborative health information technology (HIT) initiative responsive to the mandate from the Institute of Medicine's Committee on Data Standards for Patient Safety—"provide immediate access to complete patient information and decision support tools for clinicians and patients."

The ParentLink project addressed two specific goals across the funding period.

Aim 1: Data Capture

To evaluate and compare the accuracy and completeness of critical historical data (including current medications, allergies to medications, symptoms, and disease-specific variables) generated by parents using ParentLink, versus data documented by physicians and nurses across diverse ED settings.

Aim 2: ParentLink's Impact on Correct and Safe Actions in the ED

To determine the effects of ParentLink on the following outcomes of care: 1) the error rate for ordering and prescribing of medications during ED care and, 2) the percent of ED visits that adhere to guideline-based actions across five common pediatric disease conditions.

Scope

Safe and effective care begins with a complete patient history. Variability in information delivery directly influences the consistency and quality of clinical decisions. Dr. Clem McDonald wrote three decades ago that there are limits to physicians' capabilities as "information processors" and that computerized reminders improve the quality of care. His landmark work in protocol-based computer reminders retains relevance for the ED setting given constraints on ED physicians' information retrieval and processing. One might ask why work done so many years ago is not established practice today in the ED. A lack of relevant, patient-

specific data in electronic form to populate knowledge bases and drive decision support limits technology development and adoption. The ParentLink project addresses this very limitation and tests a proposed solution.

The ED setting is an important portal in the health care system. ED physicians treat a unique combination of acutely ill, chronically ill, and disenfranchised populations. The ED epitomizes a high-risk setting for patient safety as defined by the Committee on Data Standards of the Institute of Medicine: multiple providers involved in the care of individual patients, high acuity, a setting prone to distractions from noise and crowding, need for rapid decision-making, and communication barriers. Despite time limitations and ambient stress, a nurse or physician is expected to gather, synthesize, and act correctly based on a comprehensive understanding of a patient. Introducing a technology such as computerized physician order entry does not solve the "data problem." Prior acquisition of accurate and complete data for patients' medication and allergy history must occur for tools such as computerized physician order entry or bar coding to be effective. Information technology in the ED must support a data-intensive workflow and address problems of missing or inaccurate data.

Methods

Development of *ParentLink*

ParentLink was modeled on prior HIT interfaces and data structures produced and evaluated by the principal investigator. Relevant historical data elements for the disease topics of interest that parents could report were assembled and a workflow of question order established across the modules of symptom history, current medications, and allergies to medications. All English language text was translated and then re-translated back to ensure accuracy.

Overview of Clinical Study

We completed a quasi-experimental intervention study to evaluate the effect of a patient-centered HIT on medication-related errors during ED care for children. During the study, control periods with usual care alternated with intervention periods wherein a parent-driven HIT application, *ParentLink*, elicited the child's medication and allergy history and provided tailored prescribing advice. The study was conducted between June 2005 and June 2006 at the ED of an urban tertiary care children's hospital (site 1) and the ED of a suburban, general community hospital (site 2). The Institutional Review Boards at both sites approved the study.

ED Sites

Site 1, the urban children's hospital ED, sees an average of 55,000 patient visits per year. The environment includes computer-based charting for physicians (EMstation, Cerner Corporation) but no CPOE. Physicians include residents-in-training for pediatrics and emergency medicine, and fellow-level trainees in pediatric emergency medicine. Board certified/board eligible physicians in pediatric emergency medicine supervise all care save for a

minority of patients seen by urgent care pediatricians. During the study period, nurses charted on paper. Medication orders were written on paper and transcribed and implemented by nurses.

Site 2, the general community ED, sees an average of 18,000 pediatric visits a year with an overall patient volume of 77,000 visits per year. Physicians include those board certified/board eligible in pediatric emergency medicine, emergency medicine, or general pediatrics. At site 2, nurse practitioners and physician assistants work independently in the care of patients. Clinical providers chart via phone dictation or computerized documentation. Nurses charted on paper but transitioned to an electronic charting method during the study period. All medication orders were written on paper.

Subjects

We enrolled parent-child dyads presenting for care in the ED setting. Parent-child dyads were eligible if the following conditions were met:

1. Parent able to communicate in English or Spanish;
2. Parent agreed to complete a follow-up telephone interview within 10 days of ED visit;
3. Parent reported being a primary caretaker and having knowledge of child's medical issues;
4. Triage status as non-critical (level 2 or below on the 5 level emergency severity index);
5. Physician evaluation and treatment had not yet been initiated;
6. One of the following age/chief complaint combinations:
    a. Child under age 12 years presenting with head trauma;
    b. Child under age 12 years presenting with ear pain;
    c. Child under age 12 years presenting with dysuria;
    d. Child between 1 year and 12 years with respiratory symptoms and a history of asthma;
    e. Child between 3 months and 2 years presenting with fever.

Study Protocol

The consent and enrollment process remained consistent during control and intervention periods. Parents were approached after nursing triage. Research assistants used computerized tracking systems to monitor patient arrival and triage for eligible subjects based on age and chief complaint data. After formal screening, eligible parent-child dyads completed informed consent.

Enrollment at site 1 occurred seven days a week from 4pm to midnight for the first 2 three month periods. Enrollment at site 1 terminated after six months and available resources were

shifted to site 2 to maximize enrollment there. At site 2, enrollment occurred from 6pm to 2 am seven days per week during time periods 1 and 2. Beginning with the third time period, enrollment hours increased from 10am to 2am.

ED-Based Research Steps. During both control and intervention periods, parents completed a written demographic questionnaire. Otherwise, during control periods, usual care proceeded without intervention.

During intervention periods, parents used *ParentLink* on a mobile kiosk (Seepoint Technology) to enter data on their child's symptoms, current medications, and allergies. *ParentLink* produced two paper-based output forms: 1) a parent-centric form summarizing parent-provided historical data, likely ED-based actions, and suggestions for the parent on pro-active communication with ED providers, and 2) a provider-centric form summarizing symptoms, medications, and allergies for the child and listing a tailored action plan for evaluation and treatment appropriate to a single diagnostic category: urinary tract infection (UTI), otitis media (OM), chronic asthma, and acute head trauma. The diagnosis-related recommendations *ParentLink* created for each subject was based on chief complaint and relevant parent-provided history. Recommendations regarding medications for treatment of pain, OM, UTI and chronic asthma were specific to the child's weight and allergy history. A senior pediatric ED pharmacist created the algorithms for correct weight-based and allergy-based dosing recommendations of antibiotic and pain medications.

Output directed at the provider was handed to the provider by the research assistant if the patient had been placed in a room and the provider had initiated care. Otherwise, the output was placed in the front of the patient's bedside chart for physician review. Post-it notes with a pre-printed message were used to alert the provider to the presence of *ParentLink* output.

Criterion Standard Interview. Parents completed a structured telephone interview within 10 days of the incident ED visit. This interview, conducted by a trained research assistant blinded to parents' kiosk entries and to ED providers' documentation, assessed: 1) the current medications in use at the time of the ED visit, and 2) the child's history of allergies to medications.

Current medications were assessed by a research assistant in English or Spanish according to the parents' preference. The telephone interview was conducted with the parent who enrolled as a study subject at the incident ED visit. To ensure that the criterion standard included all current medications in use at the time of the ED visit, the parent was asked at the start of the interview to gather all of the medications given to the child at the time of the ED visit. Medicines were described to the parent as medications prescribed by a doctor as well as any over-the-counter products (including fever or pain medicine, cough and cold medicines), vitamins, dietary supplements, or herbal supplements or teas. For each medication, the parent was asked to report the name, route of use, form (concentration), dose and frequency. Any medication reported by the parent as being given on an ongoing basis or acutely for treatment of illness prior to the ED visit was considered to be a current medication.

The history of allergies to medications was assessed using a previously published set of questions intended to maximize sensitivity in the capture of the allergy history.

Abstraction of the Medical Record. A trained research assistant reviewed the nurse and physician records to abstract documentation specific to: 1) current medication use, 2) any history

of allergies to medications, and 3) for a subset of patient cases of head trauma, details of the presenting symptoms and exam findings. All details related to medication name were transcribed if present. A notation of "no medications" was considered to represent a negative history for current medications. A lack of documentation regarding the medication history was coded as missing. For medication allergies, a notation of "NKDA" or "no allergies" was considered to represent a negative history of allergies to medications. A lack of documentation regarding the allergy history was coded as missing.

For the subset of cases with head trauma, the nurse and physician records were considered together across a series of data elements germane to an evidence-based risk assessment of intracranial injury. Documentation specific to the following data elements was abstracted: 1) date/time of trauma, 2) mechanism, 3) loss of consciousness, 4) seizure post impact, 5) vomiting post event, 6) mental status, and, 7) presence of scalp hematoma.

Outcome: Data Quality

The primary outcomes were: 1) the percent of parent-child dyads with a valid medication list as documented by the parent, nurse and physician, 2) the percent of parent-child dyads with a valid list of medication allergies as documented by the parent, nurse, and physician, and 3) the percent of responses for each element of the acute head trauma history that were complete as documented by the parent and the ED clinical record.

We scored the validity of medication and allergy lists as documented from parents using the *ParentLink* kiosk and by physicians and nurses as documented in the medical record. We limited our analysis to a pre-specified list of 100 common medications. A response (either positive or negative) for each medication was considered valid if it correlated with the answer from the criterion standard interview. Invalid responses were classified as either inaccurate (or "over-reporting," i.e., reporting a medication which was not reported in the criterion interview) or incomplete (or "under-reporting," i.e., failing to report a medication that was reported in the interview, or the absence of any data recorded for that element). For each data reporter (parent, nurse, physician), the overall response was considered valid if the medication names documented matched the names on the criterion standard interview. Invalid overall responses could include incorrect responses, incomplete responses, or both.

Outcome: Medication Error

The primary outcome was the number of medication errors per 100 patients. This outcome summed all medication error events inclusive of preventable adverse drug events (ADEs), near misses and errors. Secondary outcomes included: 1) percent of patients who experience at least one serious error (near miss or preventable ADE), 2) the number of medication errors per patient among those who were "exposed" to an order or prescription for one of the medications on which *ParentLink* provided a recommendation, and 3) percent of errors attributable to incorrect allergy history or lack of medication reconciliation.

Definitions of Error. Consistent with Institute of Medicine definitions, a *medication error* was defined as an error in drug ordering, transcribing, dispensing, administering or monitoring.[15] An error was considered *serious* if it had potential for injuring a patient, regardless of whether the error was intercepted or not. Compilation of medication errors did not include errors of

omission related to evidence-based treatment. An ADE was defined as an event associated with patient harm from exposure to a drug.

Evaluation of ED-Based Medication Actions. A single trained nurse abstractor examined records from all subjects to determine errors. The nurse reviewed all available medication-related evidence, including medication order sheets, medication administration records, physician and nurse charting, discharge instructions, and prescription records where available. An inventory of all medication orders and prescriptions for each subject was created, and each order or prescription was reviewed. A separate log of errors was created for each subject, with each error rated for severity and classified by error type.

To determine the occurrence of adverse drug events in subjects, the nurse reviewed the ED record as well as data from the telephone interview. Adverse drug events were recorded on event sheets and linked back to ED-based medication orders or prescriptions when possible.

Errors classified by the nurse as serious (near misses and ADEs) were separately reviewed by a two-person panel (physician and pharmacist). Reviewers were blinded to date of event/time period but not to site of care, as certain medication events were site-specific and could not be masked. The panel assigned the final classification (exclude, simple error, near miss, ADE) and gave a preventability designation to those judged as ADEs.

Outcome: Incorrect Action

Definitions of Incomplete and Incorrect. An incomplete record was defined as one in which there was insufficient documented data to judge whether the clinical action was indicated. For example, a chart missing documentation about pain assessment for a patient with head trauma was judged incomplete for determining whether the child required pain medication.

An incorrect action was defined as the failure to complete an indicated action (error of omission) or the initiation of an incorrect action (error of commission). In the example of head trauma, failure to obtain a head CT in a 14 month old with a scalp score of 8 would constitute an error of omission, while obtaining a head CT in a 5 year old who sustained head trauma three hours earlier and was without loss of consciousness, without emesis, without headache, and with normal mental status would constitute an error of commission.

Measurements. Evaluation of Clinical Actions Taken in ED. The nurse abstractor judged whether the child's history and final diagnosis fit into an existing disease category of interest (UTI, OM, asthma, or head trauma).

A subject was only judged on the single most applicable disease category. Each disease category included judgments of correct actions at specific process steps. Not every step was applicable to each disease category. Each process step within the assigned disease category was coded as one of the following: correct, incorrect, insufficient data to judge (incomplete), or not applicable.

Limitations

This evaluation of *ParentLink* highlights important challenges and limitations for system-level research on a novel pediatric technology. *ParentLink* was not tested by "all comers," but only by parents willing to participate in research. Although clinical leaders at both sites

supported the *ParentLink* initiative and the study was visible to providers caring for enrolled patients, no structured process of audit, feedback, or incentives was implemented. Further, *ParentLink*'s scope was limited to certain medications and patients with certain chief complaints. As a result, providers were intermittently exposed to the intervention and the technology's impact on practice was constrained.

In both sites, no CPOE systems existed to directly connect *Parentlink*-produced data to medication-related actions. This limited our ability to force certain provider actions. The paper output employed in the *ParentLink* study represents a best effort mechanism to reach the clinician at the point of care but, ultimately, is a weak signal that may fail to reach or be ignored by a clinician.

The clinical algorithms produced for *ParentLink* regarding UTI and head trauma rely in part on experts' interpretation of current evidence in light of previously published guidelines. Clinical practice does not always keep pace with current evidence. And even where strong standards exist, clinicians often deviate from them in actual care delivery. Clinicians may disagree with recommendations or may have case-specific reasons for non-adherence. Providers within and across the tertiary care pediatric hospital and the suburban general hospital likely have different views towards each guideline.

The criterion standard interview considered the parents' post-ED report of medications as the most correct estimate of current medications. Recall bias may influence this criterion standard, as the method may not detect a medication that was current at the time of the ED visit but prescribed for only a few days (with the parent no longer having the bottle in their possession.) Further, the telephone follow-up process clearly introduced some bias with regard to the characteristics of those who we could contact by phone. The evaluation of documentation by physicians and nurses in the ED does not necessarily reflect their active awareness of specific historical data wherein questions may have been asked, and answers given, but certain data not documented after that discussion.

Results

Technology Development

The *ParentLink* application had five major developmental goals:

1. Design a front-end interface for patient-driven data capture that recognizes human-based, temporal, and environmental constraints of the ED setting;

2. Implement an interface neutral to patients' technology-based experience;

3. Create architecture for the display and capture of medication data;

4. Implement a rules-based approach to link parent-derived data to evidence-based decisions;

5. Encourage "activated and informed" patients and "prepared and proactive" providers;

As created to meet these general functional specifications, *ParentLink* has five distinct functional components: Graphical User Interface, Workflow Manager, Data Persistence, Rules Engine, and Output Generation.

The application is written in the JAVA programming language using the Eclipse Project's Standard Widget Toolkit. The application is platform independent, provided that the operating system supports JAVA, mySQL, and a PDF reader along with a data entry device such as mouse, light pen, or touch-screen. The architecture separates the graphical user interface from the business logic to ensure that migration of the *ParentLink* system into new clinical environments can accommodate local variation. Rules for mapping of parent-derived historical data to evidence-based decision-making were developed from existing national guidelines and current evidence regarding best practice for four specific conditions: head trauma, otitis media, urinary tract infection (UTI), and asthma. Output messages use a semantic structure that recognizes potential tradeoffs between strength of evidence and the risk-benefit ratio of tests or treatments.

The semantics of a patient-driven interview for the topic of allergies to medications cannot presume that a patient understands the concept of allergy or sub-concepts such as "hives." As such, the *ParentLink* product begins with a general interrogatory "Has your child ever had a problem or reaction to a medicine?" Subsequent questions posed to the parent inquire about WHAT medicine was causative, WHAT TYPE of problem or reaction the parent observed, and RELATED FACTORS regarding time of onset and descriptive features of the event. Details reported for a given medication or class-level report are analyzed and reported out using semantics endorsed by the American Academy of Allergy Asthma and Immunology for hypersensitivity and intolerance/side effect.

The interface design for capture of medication data considers how a patient might recognize a medication name during human-computer interaction. The *ParentLink* product organizes medication names by category of drug such as medications for fever, medications for seizure, medications for asthma. Within each category, a "screen within the screen" displays an alphabetical list of all medication names (generic and brand names listed individually) that relate to the category in question. The number of medication names to display exceeds the capacity of a single page for many categories, and embedded visual cues in the interface guide the user's awareness of where they are in the list. Responses endorsed by the parent are re-displayed to confirm their accuracy. The current version of *ParentLink* supports medication report across a limited data set of the following categories: antibiotics, anti-pyretics, analgesics, anti-histamine, asthma-specific, and seizure-specific drugs.

Once names are identified, the system iteratively displays data for a given medication regarding possible form types, strength (dependent on form type), dose (dependent on form type) and frequency. The complex array of form types for medications results in confusion for users if the form type names are presented "as is" directly from the manufacturer. A meta-level construct of super-groups for form types of medications allows for a parsimonious list of easily understood names to be presented to the user. As such, the form descriptors "oral solution" and "elixir" and "oral liquid" are all displayed as "oral liquid or suspension" with further product differentiation occurring at the level of medication strength.

ParentLink achieves generalizability in its design and architecture. The look and feel of the interface remains simple and clean with a color palette of blue, black and gray. Use of images is constrained to only the instances in which the image brings clear value to the acquisition of accurate data. As such, migration of the interface across platforms and operating systems will result in minimal alteration of its appearance and functionality. The architecture separates the

graphical user interface (GUI) from the business logic to ensure that migration of the *ParentLink* system into new clinical environments can accommodate local variation. The medication database is maintained as a separate entity; currently, the dictionary exists as a local knowledge resource uncoupled from pharmaceutical resources such as the Martindale® or Drugdex ® systems. *ParentLink* produces output tailored to two audiences: the parent who entered data and the clinicians who will care for the child. The functional component that supports production of output remains distinct from workflow and GUI elements to allow for variation in form and content of messages.

The output produced for clinicians summarizes allergy and medication data and presents the information as a preliminary list to the clinician reviewer. Data on allergies includes medication name and the type of hypersensitivity reaction consistent with details reported by the parent. The allergy output includes an "uncertain" category for instances wherein parents' data do not clearly map to a given hypersensitivity type. Data reported out for medications includes medication name, form type, strength, dose and frequency. Parents' yes/no report regarding use of homeopathic and over-the-counter cold and cough products appear on the medication list as a general item for further review and data discovery by the clinician.

Data elements captured by the system directly from parents include: 1) elements of the history of present illness and past medical history for specific chief complaints, 2) allergies to medications, and, 3) current medications. These data populate a centralized knowledge base from which evidence-based recommendations are generated regarding: 1) tests that are recommended for head trauma and UTI (correct actions), 2) tests that are not recommended for head trauma (incorrect actions), and, 3) medications that are recommended for treatment of pain, UTI, asthma and otitis media (including weight-based doses, frequency and duration of therapy). The output from *ParentLink* summarizes the parent-produced allergy and medication list that serves as a template for reconciliation efforts – a key process step to support medication safety.

Because clinical care in the ED is complex, decisions are often made on the best available, but not always complete, information. Elson has described an industrial view of information delivery that serves to highlight areas where the nature of an ED-based encounter may not yield the best possible information at the right time. *ParentLink* represents an attempt to augment the physician-patient interaction by organizing a structured and relevant history, and delivering the information along with focused recommendations about management to the clinician in real-time.

Clinical Study: Preliminary Results

A total of 2002 parent-child dyads were screened and 1411 consented to participate. Reasons for ineligibility (n=192) included emergent need to be seen by the physician (n=41), physician had already completed the evaluation (65), parent did not speak English or Spanish (28), primary caretaker not present (9), patient would not be available for follow-up (11), or patient had respiratory problem without history of asthma (38). An additional 351 patients were eligible but the parent declined to enroll: parent felt it would take too much time (113 of 351), parent felt child was too ill (50), parent did not like research (59), parent was unwilling to follow-up (32), unspecified reason (97). Finally, consent was not obtained for 48 patients, leaving a total of 1411 enrolled and consented patients. One patient was excluded from analysis for protocol violations. Follow-up telephone interviews were completed with 1111/1410 (79%) parents. 835 subjects were enrolled during control periods, and 575 enrolled during intervention periods.

Subjects in intervention periods (versus control) were more likely to self-report as Latino, less likely to self-report as Caucasian, and more likely to have a younger child.

Table 1. Report of enrollment of priority populations in ParentLink study

Population	Number proposed (% proposed total)	Number enrolled (% enrolled total)
Parent-child dyad	3413 (100)	1410 (100)
Parent (female)	2730 (80)	1184 (84)
Child	3413 (100)	1410 (100)
Latino	854 (25)	135 (10)
African-American	1468 (43)	85 (6)

For the outcome of data quality, *ParentLink* demonstrated benefit for parent-produced data through structured capture and interpretation. Parents using the HIT produced more complete documentation of data elements needed for evidence-based decision making for acute head trauma. Parents' documentation of allergies to medications using *ParentLink* produced more valid information than that documented by nurses and physicians.

For the outcomes of medication errors, *ParentLink* did not influence overall rates of error when comparing control and intervention periods. Similarly, *ParentLink* did not influence overall rates of incorrect actions. A sub-analysis on specific steps for pain-related documentation and treatment did show that *ParentLink* may influence improvements in providers' recognition of and response to pain experienced by a child.

The *ParentLink* study highlights key issues for HIT and its role in promotion of safety in pediatric care - namely, how to incorporate the technology into workflow, and, what forms of reminders and alerts are most effective in supporting clinicians in correct actions. In emergency medicine, such considerations are especially relevant as the acute care environment is complicated by variations in patient acuity, parallel treatment and assessment paradigms, and provider-level attentional constraints. *ParentLink* fulfills a mandate for an HIT product that provides front-end data acquisition and creates signals for downstream use. Early capture of relevant and accurate information in electronic form directly from parents is possible during real-time emergency care. However, the signal created and the channel used for output from *ParentLink* did not alter the rate of medication error or broadly influence correct actions. Further work on patient-driven HIT solutions should occur within existing data systems and decision support tools to offer in-line alerts and reminders that integrate into providers' workflow and cognitive steps. Novel technologies such as *ParentLink* should play a role in the evolution of robust ambulatory information infrastructures.

List of Publications and Products

(As of 9/30/2007)

ParentLink. A parent-driven software application for collection of data on symptoms, medications, and allergies. Porter SC. Children's Hospital Boston and Agency for Healthcare Research and Quality. Available at http://parentlink.chip.org

SC Porter, R Kaushal,D Goldmann, L Kalish. Can a Patient-Driven, Information Technology Solution Influence the Safe Prescribing of Medications? [abstract] Platform presentation at the Pediatric Academic Societies Meeting, Toronto, Ontario, Canada, May 2007

U Nehal, L Kalish, SC Porter. Impact of a Patient-Centered Technology on Parent Satisfaction in the ED. [abstract] Platform presentation at the Pediatric Academic Societies Meeting, Toronto, Ontario, Canada, May 2007